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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/530,428

04/05/2005

Marc Bednarz

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5771

81900

7590

09/24/2008

Klaus P. Stoffel  
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EXAMINER

ONEILL, KARIE AMBER

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/530,428	<b>Applicant(s)</b> BEDNARZ ET AL.	
	<b>Examiner</b> Karie O'Neill	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 18-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 18-37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. The Applicant's amendment filed on June 30, 2008, was received. None of the Claims have been amended. Therefore, Claims 18-37 are pending in this office action.
2. The Declaration under 37 C.F.R. §1.132, dated June 30, 2008, has been received and considered by the examiner.
3. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on February 27, 2008.

### ***Claim Rejections - 35 USC § 103***

4. The rejection of Claims 18, 20-27 and 29-37 under 35 U.S.C. 103(a) as being unpatentable over Friedrich (WO 02/41423 A2), using Friedrich (US 2004/0062981 A1) as an English translation, are maintained. The rejection is repeated below for convenience.

With regard to Claims 18 and 27, Friedrich discloses an electrolyte matrix and method for producing an electrolyte matrix for a molten carbonate fuel cell which comprises lithium carbonate, aluminum oxide and a carbide (paragraph 0039), in the green state (paragraph 0027). Friedrich discloses the carbide as being zirconium carbide. Friedrich does not wherein the carbide is titanium carbide. However, it would have been obvious to one of ordinary skill in the art to use titanium carbide in the electrolyte matrix of Friedrich, because zirconium and titanium both belong to group 4 of the periodic table and they are hard refractory metals with low aqueous solubility and

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low availability to the biosphere. Therefore, it would be obvious to substitute titanium for zirconium because the group 4 elements would provide similar properties as recognized by one of ordinary skill in the art.

With regard to Claims 20-21 and 29-30, Friedrich discloses wherein the matrix material additionally contains nanoscale secondary particles, wherein the nanoscale secondary particles are at least one material of the group consisting of  $ZrO_2$ ,  $SiO_2$ ,  $Al_2O_3$  and  $TiO_2$  (paragraph 0039).

With regard to Claims 22 and 35-37, Friedrich discloses wherein the matrix material is incorporated in the "green state" into a molten carbonate fuel cell and is composed to undergo synthesis when the fuel cell is started (paragraph 0027), accompanied by an increase in volume (paragraph 0007), and contains lithium aluminate and lithium zirconate (paragraph 0027). Friedrich does not disclose wherein lithium titanate is formed during startup of the fuel cell. However, if titanium was used as an alternate to zirconium, as discussed above, the chemical reaction of lithium carbonate and titanium carbide would form lithium titanate, as it forms zirconium titanate when lithium carbonate and zirconium carbide are reacted. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use titanium carbide in the matrix electrolyte of Friedrich, because zirconium and titanium both belong to group 4 of the periodic table and would provide similar properties since they are hard refractory metals with low aqueous solubility and low availability to the biosphere.

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With regard to Claims 23-24, Friedrich discloses wherein after the fuel cell has been started up, the electrolyte matrix has an open porosity of 30 to 70%, more preferably of 40 to 60 % (paragraph 0032).

With regard to Claims 25-26, Friedrich discloses the electrolyte matrix having an increase in volume when the fuel cell is started up. Friedrich does not disclose wherein the volume increase is 2.5 -5%, more preferably 3-4%. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use materials which would provide a volume increase of 2.5 to 5%, because due to an increase in volume of the electrolyte matrix, there is an increase in the contacting pressure between the electrolyte matrix and the electrodes, as well as their current collectors, which leads to a higher cell output, and since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. See MPEP 2144.

With regard to Claims 31 and 34, Friedrich discloses mixing the matrix material in finely powdered form with a dispersion medium/solvent to form a matrix slurry, which is then shaped and dried (paragraphs 0039-0040), wherein shaping the matrix slurry includes casting, rolling, spraying or application by doctor blade (paragraph 0041).

With regard to Claims 32-33, Friedrich discloses mixing the lithium compound, aluminum oxide and carbide with water and/or organic acid, followed by the steps of ball milling, homogenizing in a reactor and then molding and drying. Because the step of drying occurs to the matrix slurry, it would be obvious that the solids content of the

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matrix slurry would be at least 50%. When something is dried, the liquid is removed and the slurry becomes solid.

5. The rejection of Claims 19 and 28 under 35 U.S.C. 103(a) as being unpatentable over Friedrich (WO 02/41423 A2), using Friedrich (US 2004/0062981 A1) as an English translation, as applied to Claims 18, 20-27 and 29-37 above, and in further view of Sim et al. (US 4,251,600), is maintained. The rejection is repeated below for convenience.

Friedrich discloses an electrolyte matrix and method for producing an electrolyte matrix for a molten carbonate fuel cell, but do not disclose wherein the matrix electrolyte material additionally contains aluminum hydroxide.

Sim et al. discloses a molten electrolyte within a fuel cell containing a slurry of aluminum hydroxide and lithium hydroxide. The slurry is dewatered and dried, causing a portion of the mixture to react and form dehydrated lithium aluminate. Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to use aluminum hydroxide as part of the electrolyte matrix of Friedrich, because Sim et al. teaches aluminum hydroxide being of a fine particle size and aiding in the step of agglomeration of particles (column 2 lines 1-3 and column 3 lines 11-13).

### ***Response to Arguments***

6. Applicant's arguments filed June 30, 2008, have been fully considered but they are not persuasive.

*Applicant's principal arguments are:*

*(a) Applicant submits that the Declaration, made by one of the inventors, supports that the substitution of zirconium for titanium in the Friedrich reference is not obvious. Applicant submits that "the Declaration states that the shelf life of lab electrolyte matrix green tape samples using zirconium carbide was limited to a time frame of 2-4 weeks, depending on temperature and humidity. This time frame is far too short for a commercial use of this material in Molten Carbonate Fuel Cells (MCFC). Thus, since zirconium carbide only provides a very limited shelf life, those skilled in the art would not find it obvious to use other materials contained in the same Group of the Periodic Table since it would be expected that these other materials of the same Group would provide an electrolytic matrix with a shelf life similar to that of zirconium carbide. Furthermore, during the stacking procedure, the behavior of the ZrC containing samples showed a loss of mechanical flexibility, a change in sample density and discoloration, indicating undesired chemical reactions".*

In response to Applicant's arguments, please consider the following comments:

(a) Although the Declaration states that Marc Bednarz is "familiar with" the instant invention and the cited prior art reference, the Declaration is not persuasive because no data has been given to support the argument that zirconium carbide is not an obvious substitution for titanium carbide. Specifically, the declaration does not describe documented results for each material, the procedure that was followed to

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produce the green tape mixture of zirconium carbide and what type of quality control measurements were performed in order to determine a loss of mechanical flexibility and a change in sample density and discoloration. It is necessary to know what components are involved with the shelf life and mechanical comparison between titanium carbide of the instant invention and the zirconium carbide of the cited prior art. Therefore, the declaration does not provide evidence to overcome the rejection of record. Additional evidence comparing the materials would be required to overcome the rejection.

### ***Conclusion***

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karie O'Neill whose telephone number is (571)272-



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8614. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Karie O'Neill  
Examiner  
Art Unit 1795

KAO

/Mark Ruthkosky/

Primary Examiner, Art Unit 1795